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New fish assemblages from the Middle Permian from the Guadalupe Mountains, West Texas, USA

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Abstract

Late Wordian/Capitanian (Guadalupian, Middle Permian) fish assemblages are described from the "McKittrick Canyon Limestone", Lamar Limestone and Reef Trail Members of the Bell Canyon Formation in the Patterson Hills and the PI section (Hegler/Pinery Members) along Highway 62/180 in the Guadalupe Mountains, West Texas. The assemblages contain chondrichthyan teeth of *Stethacanthulus meccaensis*, *Texasodus varidentatus*, *Cooleyella* cf. *amazonensis*, *C.* cf. *peculiaris*, and the new genus and species *Lamarodus triangulus*; and buccopharyngeal denticles of undetermined symmoriiform; chondrichthyan scales of eight morphotypes; fragment of an actinopterygian jaw, isolated teeth; the scales of *Alilepis* sp., *Varialepis* sp. and undetermined elonichthyid and haplolepid fishes. Using microtomography, the vascularization system has been observed for the first time for the teeth of *Texasodus varidentatus* and a new taxon *Lamarodus triangulus*. The distribution of chondrichthyan taxa was analyzed for the known fish assemblages of the Early, Middle, and Late Permian of the world. The end-Guadalupian crisis in the evolution of chondrichthyan fishes involved substantially more taxonomic change than the Permian–Triassic mass extinction.

Keywords: Fishes; Middle Permian; Guadalupe Mountains; Texas

1. Introduction

Fish assemblages from the Middle Permian (Guadalupian) of Texas, USA have been studied from strata equivalent in age to the Lamar Limestone and Reef Trail Members of the Bell Canyon Formation (Capitanian) of the EF and M sections in the Apache Mountains (Ivanov et al., 2013) and from the Rader Limestone Member of the Bell Canyon Formation (Capitanian) of the "Rader Slide" section in the Guadalupe Mountains (Ivanov et al., 2015b). The assemblage from the Apache Mountains includes the teeth of symmoriiform *Stethacanthulus meccaensis* (Williams), jalodontid *Texasodus* sp., euselachian *Sphenacanthus* sp., the scales of undetermined euselachians, probably a hybodontoid, and other chondrichthyans; the actinopterygian microremains of an elonichthyiform *Varialepis* sp. and undetermined fishes. The assemblage from the Guadalupe Mountains contains the teeth of the symmoriiform *Stethacanthulus meccaensis* (Williams, 1985); jalodontid *Texasodus varidentatus* Ivanov, Nestell and Nestell, 2012b; hybodontoid "*Polyacrodus*" sp.; neoselachian *Cooleyella duffini* Ivanov in Ivanov et al., 2015b, as well as various chondrichthyan scales, teeth and scales of actinopterygian fishes including haplolepid, elonichthyid and *Varialepis* sp.

The new assemblages of Guadalupian chondrichthyan and actinopterygian fishes described herein occur in two regions of the Guadalupe Mountains, West Texas (Fig. 1): in the PI-section (Hegler/Pinery Members) exposed on the north and south sides of US Highway 180/62 (Wardlaw and Nestell, 2015) and in three sections ("McKittrick Canyon", Lamar Limestone and Reef Trail Members): GUMO GEO 00020 (SC1 section

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